Improvement in urban storm water management: analysing the innovation process through the three observatories of urban hydrology in France

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Abstract

My thesis in sociology takes place in a big research program studying contaminated storm water in urban areas in order to develop new processes to cope with pollution. Most of the researchers of the program are biologists, chemists, hydrologists. The study also conveys sociology insisting on the importance of a multidisciplinary approach. Why would a sociologist be needed to help understand a topic such as water pollution, which seems to be a really technical issue? In fact, I am looking to "study my colleagues who study chemicals", and the contribution of their discoveries.

Because innovation isn't just about technical inventions. It's a political and social question too. How can a sociologist be part of such a project? What are his/her particular methods? These are important questions, as more and more scientific programs, especially regarding environmental issues, aim to associate hard sciences and social sciences.

Keywords

Storm water management; observatories; innovation; urban hydrology; local

INTRODUCTION

For decades, cities have to face new environmental problems linked with increasing urbanization that have sometimes developed without being enough controlled or planed. Water management is a good example: inefficient water networks in the city (regarding waste water as well as storm water) can lead to great damages such as floods and environmental pollutions. Storm water management in particular is a growing concern, as researches have been realising since the seventies that storm water were highly contributed to environmental pollutions – in lakes, rivers, sheets…
Authorities need more data and analysis to cope with these new environmental risks, which are deeply linked to human activities. That's why new orientations of public policies go with a huge development of monitoring programs in many fields, environmental but also economical or social ones.

In France, only three large towns for the moment have developed specific organisations dedicated to the monitoring of impacts of urban waters on environment, called "observatories in urban hydrology". These are special places for researchers and managers to share their needs and work on solutions. At first glance, these organisations appear to be more the results of an initiative coming from scientists rather than a governmental concern, but it does involve local authorities too.

The study I'm conducting is part of a research program called "Innovations for sustainable water management in urban areas", initiated by the three observatories. It aims at improving knowledge and control of storm water pollution in order to protect environment. This common program is also an opportunity *to study the innovation process toward storm water management in the observatories* by conveying a sociological approach. I'm in charge of this aspect.

This project, which associates social sciences to hard sciences in the same research program, reveals a current trend: people tend more and more to include humanities to the analysis of technical aspects. In fact, environmental issues are so complex that traditional technical approaches are not sufficient to understand the whole problem. For example, reducing pollution is not just about improving WWTP or setting up new tools to cope with pollution. Reducing pollution also means to change people practices, to create some lows to push firms and public services to do their best to avoid damaging the environment…

This paper will first introduce the context of the study: main subject, sites and objectives of the research. It will then present the methods used to produce results, focusing especially on the "proof" in social sciences. At last, we will show how first results, confronted to theoretical concepts, can be turned into research hypothesis and lead to a new core question.

Subject, sites and objectives of the study

A starting point: defining "innovation" in link with the topic

To start my researches, I had to define what can mean innovation in political sciences. Most of time, innovation in social sciences is studied by economists who mainly focus on technological inventions. Innovation is usually linked to the development of a new product on the market of goods and services or to the improvement of methods of production. Changes affect most of time material, human resources and ways of working[1]. Such innovations generally come out from scientific inventions, initiated in private or public research units.

In this way, we have first *to consider innovation has a "process"*. An invention remains an "invention" if it is not used, if it does not impact organization's running, making-decision processes or people's behaviours. An invention needs users to become an innovation. That's why innovation is a political and social phenomenon, as much as a technological one.

Economical definitions are not so satisfying if we consider the public management field and the environmental questions, such as storm water management. First, innovations produced in these areas do not aim at being more competitive on the market. Secondly, these analyses tend to deny or at least lower the social and political aspects surrounding innovation, whereas these elements are very important when we study public policies.

So I preferred to start the survey with a wider definition of innovation. I found it among anthropologist's studies, which tend to define innovation as a "complete social fact". It means innovation reflects the whole society: its believes, its systems, its cultural changes, its social and political opportunities…

For example, an anthropologist, Pierre Gouletquer, shows how the new activity of extracting salt from mud appeared as the result of deep evolutions: "Invention here is not the birth of a new technique that makes possible extracting salt from mud. The invention, so as to say, results in the

[1] Cf. Le manuel d'Oslo de l'Organisation de Coopération et de Développement Economique

political and economical restructuration that leads to take a commercial advantage of a potential neglected so far. (…) In other words, the "innovation potential" can't be analysed only through a technical process separated from the context. Drivers of changes consist in a redistribution of powers and a new structure of territories in the area, technical inventions and diffusions of new materials becoming indeed minor aspects." (Flichy, 1995).

Regarding the study I'm conducting, the goal is not to neglect or reduce the importance of technological improvement, but to look at innovation from a more global point of view. That's why a political scientist is needed: to go far beyond technical dimensions and analyse innovation through a "global sociology of changes" (Hassenteufel, 2008).

Studying innovation requires focusing on:

- Political and social context
- Technical possibilities
- People involved in the process and coalitions between main groups willing to change things.

Topic and sites

The main focuses of my study are the 3 Observatories of Urban Hydrology existing in France: OPUR from Paris (94), OTHU from Lyon (99) and ONEVU from Nantes (2006). OPUR, OTHU and ONEVU work mostly on the same topic: they analyse the whole water cycle, from the atmosphere to the ground including the in-between steps as network, flows, streaming… Researches mainly focus on pollutants in urban areas and their impact on the environment.

An observatory of urban hydrology can be defined through four main features, which can be seen in each structure:

- Real testing sites are tool up by researchers and managed by researchers and technicians of local services
- Experimentations and programs are partially fund by local authorities
- Research programmes are designed by both researchers and local authorities
- Collaborations between partners are mid-term or long-term ones

In addition, the three observatories work on urban and suburban areas, in catchment areas of different sizes.

The observatories are a tool to improve relations between local authorities and researchers. It is supposed to favour communication between the two and help to link scientific questions to management issues.

From this point of view, the observatories are in it-selves a way to *favour innovation*. Indeed, I have to analyse *innovation through these dedicated structures*.

Nevertheless, even if there is a lot of communication between researchers coming from each area, each observatory has developed its own research programmes, local concerns, methods... They work mainly on the same topics, but there are differences between the three, which can be sum up in the following categories:

- Target of researches: the structures differ on the specific area of researches (some take into account the impact of polluted water on the environment – rivers, sea… other just look at pollution *into* the water network and mainly focus on pollution in the city, etc.)
- Sites they set up their experimentations: some sites are chosen regarding their hydrologist conditions, other because it is especially at stake for local authorities…
- Goal of researches: some teams prefer developing studies with very concrete outcomes, other tend to be closer to basic research…
- Research programs, which are more or less negotiated with local authorities: some studies are exclusively defined by researchers whereas other researchers make a great deal about listening carefully to the public services needs…
- Practices and materials: they use different types of pluviometers or radars, have different sampling options, results certification…
- Age of the structures
- Size and means
- Social and political context: some structures are very praised and supported by elected representatives; others suffer from a lack of recognition. In addition, some areas are really willing to fund research programs, for others, it is not a prior concern, so they are not that involved.

So I have to analyse the *innovation process according to each observatory* and each territory. In this way, I will have to identify global paths and mechanisms favouring innovation, but also local dynamics, related to context, history and people coming from each place.

Objectives of the study

Actually, my work aims at two kinds of objectives:

- To produce some original knowledge about *innovation in urban hydrology* (this goal is linked to "pure sciences" objective)
- To show how *the scale* (national or local) of public policies and *local context can impact on the innovation process:* are drivers very different in Lyon or Paris? Do different place produce very different innovation policies?
- To favour innovation in these three places (Lyon, Nantes and Paris), thanks to the expertise produced through my PHD's. Identifying "the drivers of innovation" may boost changes.

The third objective is more related to a concrete application of knowledge. This kind of PHD's, which is oriented toward action, is called "research-action". It implies special methods and positioning of the researcher that I will develop later on in the methodological part.

In other words, I can describe my mission this way:

- To do a socio-history of collaborations between researchers and local authorities (engineers from public services, technicians, representative elected…) in order to understand the paths leading to the birth of the observatories ;
- To discover, in this history, the main factors leading to changes in storm water management ;
- Thanks to these current elements, to be able to propose some scenarios for changes likely to happening in the future toward innovation policies.

The scheme below sums-up the starting project:

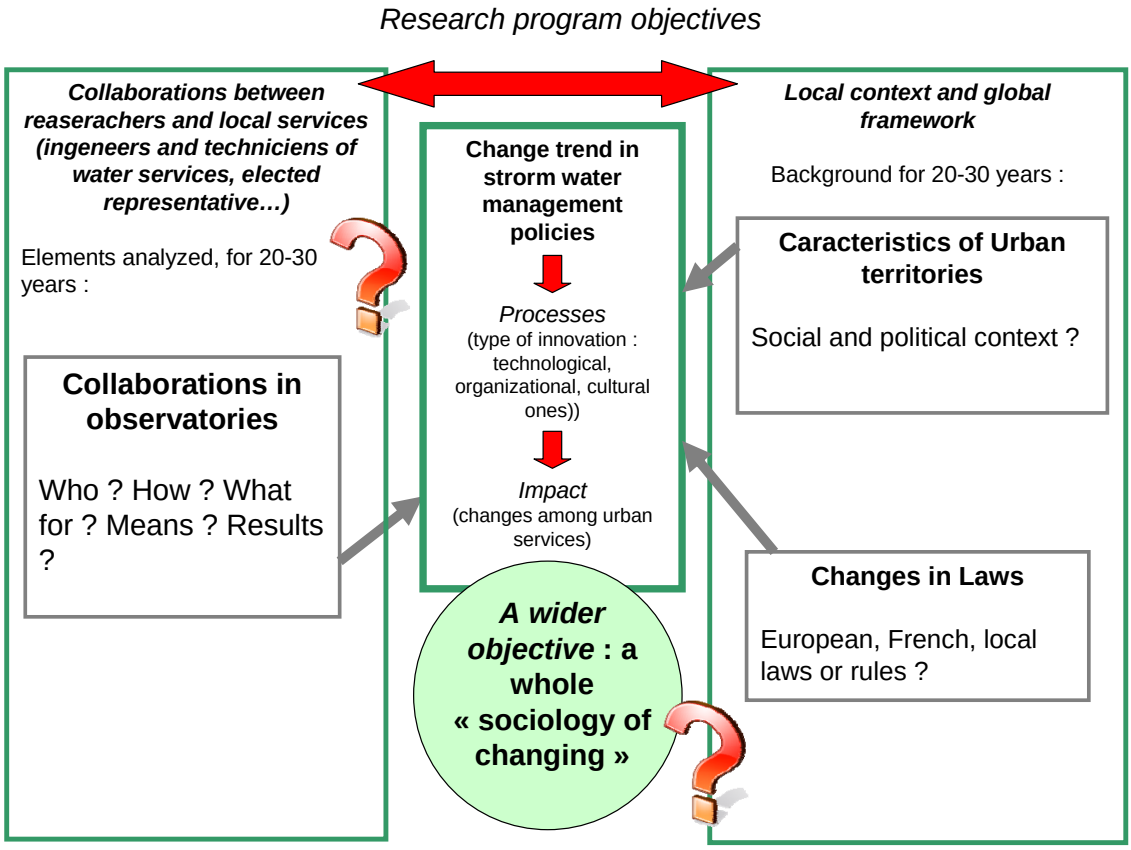

Fig. 1: A very qualitative approach requiring to construct "objectivity"

A mainly qualitative approach based on interviews and analysis of archives and current documents

So far, I intended to reconstruct the birth of collaborations between researchers and public services, since, as I previously mentioned, *innovation appears when an invention comes out a laboratory to be used* (in this case, when it is adopted by technicians in water management services). In this way, communication and collaborations between both sides is a main element.

To reconstruct the "immediate history" of collaborations, I have two main "materials":

- Interviews with relevant people considering the topic: researchers that initiated the first collaborations at national scale but also at local scales (in Paris, Lyon and Nantes) but also civil servants from local public services, elected representatives of these different areas…
- Archives: relevant documents for the observatories (meetings report, partnership conventions, activity reports…) and institutional documents showing Paris, Lyon and Nantes' evolution (social context, evolutions of public services, major political changes, evolutions of budgets, birth of new services, organisation charts…)

Featuring immediate history is a real challenge. Indeed, in that time, all papers were not archived, and pretty much nothing was saved in computers. That means it is really difficult to find tracks of these collaborations through official or formal documents. Of course, there are some papers left, but sometimes you have to do without a "material proof".

That's why interviews are so important: this is often the only memory left. But this raises another problem: people testimonies can't be vague. People are asked to talk about events that occurred 20 or 30 years ago, they have sometimes difficulties to remember exactly the dates, name of institutions or supervisor, the exact list of persons involved in such research programs…. This has two consequences:

- This method enables the researcher to get to the "spirit of collaborations", the "global sense of the recent history", but with few details ;
- The researchers has to conduct a quite important number of interviews, in order to confront the different stories and to validate the information's (it's usually the case in social sciences, but this precaution is even more necessary here).

In this way, we also confront the *researchers' vision* and the *engineers or technicians from public service's ones*. Both categories are being asked the same questions about the way they collaborate, their visions of problems and of solutions.

This is very useful because the gap between their approaches teaches us a lot about the difficulties of collaborations: misunderstanding, biased representations of each others… Interviews of researchers have been accomplished; it will be confronted to engineers and public services supervisors' speech in the following months.

From "subjectivity" to "objectivity"

When they are interviewed, the way people pictured themselves, their actions, their role, their responsibilities, their successes or failures reflects their subjectivities. But in human sciences, it is not an insurmountable problem, in spite of what one may think. Indeed, there is many ways to go over this difficulty and consider these testimonies as real research materials.

1. Considering that people "representations" or visions are more important than the "objective truth" that does not exist in itself.
The main paradigm in sociology is that "the facts are constructed by people". Truth does not exist in itself, "social classes", "gender differences", "better solutions", "prior concern" do not exist in it selves, they are not a "natural phenomenon". People in society create, by their believes and behaviours, "social categories", "problems to solve", "differences between men and women", "political priorities"… In this way, researchers in social sciences have to study people's visions, believes, preferences, understanding of reality to understand *why they act the way they do*, why they fight for this cause instead of another one… The only way to understand these social facts is to listen to people, and to analyze their visions. Taking into account each one's subjectivity is the only mean to explain social facts.

2. Looking for other proofs
Of course, researchers try to confirm what he has been told with other proofs. In this way, we can set up others indicators, when it is possible. For example, some people I interviewed tend to say that observatories are quite close to local authorities. I tried to confirm this hypothesis through others evidences: we can't try to check the number of meetings per year (do they meet 2 times, 5 times, 10 times a year…), to study the list of participants, to look for events organized by both parts or involving the two institutions.... Do reserchers and technicians from public services produce together technical advices through scientific articles or institutional communications? We try be as much creative as we can to constructs indicators or proofs.

3. “Deconstructing subjectivity”

Deconstructing subjectivity means “understanding why someone thinks or acts the way he does”. In other words, we try to explain by some social determinants people’s behaviours. In fact, something looking, at first glance, very “personal” can be then viewed as a social fact. From this point of view, a subjective feature can become a more “objective” one. For example, interviews show that researchers tend to be all very sensitive to a “useful science”. It means they really want their inventions to change people practices. At the same time, we note that nearly all of them are engineers by training. So, we can think (it’s an hypothesis) that their education made them sensitive to practical aspects. What appeared first as a “personal preference” can be more than a subjective taste and become, if a great number of testimonies agree, an “social fact” more objective. It means we don’t take it for granted with a naïve look, we always answer ourselves: *why would he/ she say that? Why would he/ she present things this way? Why would he/she insist on this aspect?*

Listening to the observatories leaders, I know that, even if they tend to be sincere when they answer my questions, they also want to valorise their institutions and can’t tell *everything* because of their institutional responsibilities. So I received it with quite distance.

4. “Confronting subjectivities”

We confront as much as we can testimonies. People with the same profile and being part of the same organization (researchers, technicians, leaders…) have been asked the very same questions, in order to compare their versions. It means, we don’t stop asking questions as soon as someone gave us the information. As in journalism, comparing *the same information* coming from different sources is a basic method. Except we go far beyond journalism in the number of sources and the accuracy of testimonies. We consider that a piece of information validated by many people is likely to be *accurate* and can be viewed as a fact or a result.

Positioning myself in a research action

A research-action aims at producing two kind of knowledge: “knowledge in itself”, as for a typical research, but also knowledge “to change the reality being observed and analysed”. The research is supposed to not only look at changes, but also contribute to create them. Because questioning people, looking at what they do, giving them a vision of their activity indirectly help them to think about their positions and actions, and *can make them change*.

This can be difficult, because it questions traditional positioning of researchers in two ways. First, the social scientist has usually to take some distance from the subject he is studying. This distance is needed if he wants to construct his own analysis, instead of reproducing interviewed people’s speech or superficial opinions we all carry out. Here, I have to be close to my subject (in a way, I *study my colleagues*…) if I want them to be involved in the study; Meanwhile, I have to do a real scientific work. This is difficult to manage because I have to go back and forth from “research” to “action”.

Secondly, a researcher usually makes its study in a quite lonely way. He is led by his PhD’s supervisors, but he does not really share his work outside this small group until it is done. In the case of research action, first results are often discussed among the large group which is part of the study. In my case, I often talk about my hypothesis or first results with researchers of the observatories. This is part of the game, because these elements are supposed to create debates, to make people talk until they agree on the same vision, etc. It can be awkward too because my work is judged *by people I studied*, I have to take into account their opinions and sometimes their quite strong criticism, without being too motioned or influenced. Because some hypothesis or

first results are worth it and deserve to be followed, even if people disagree with my analysis or proposals.

Theoretical readings help a lot to face these obstacles: it gives some distance and enable the researcher to develop a scientific vision thanks to concepts.

RESULTS AND DISCUSSION

Indeed, realizing about 10 interviews and confronting them to science political concepts led to some first results, new hypothesis and a more precise definition of the core problem.

Doing a socio-history of the collaborations leads to inquire into the construction of the French scientific community of urban hydrology

The French urban hydrology group is actually a small but very connected community. In the early 80's, researchers and engineers coming from different local services and laboratories work started to work together on wide national programmes lead by the government services. The teams involved joined the programme on a very informal way. Researchers coming from all over France came to "work together, talk and share points of views", according to the former leaders of the project, when they are asked to tell the story. When we consider it, this was the beginning of some friendships or at least some good professional relationships. Indeed, the first teams implicated in such national programs were then willing to keep these collaborations going. They continue to develop contacts, share data and analysis. There were a lot of exchanges, in many ways: some professionals of Lyon came to teach in Paris, some researchers of Montpellier were supervising Paris's PhD's students…

These links were institutionalised in 1988 with the birth of Eurydice, an association created, according to its founding fathers, to shape "common knowledge and patterns in urban hydrology". This association gathered researchers, engineers working in water public services, local councillors, members of consulting firms… Gathering professionals coming from different fields enable them to spread a common vision about problems in urban hydrology and relevant innovations in many places. The association also reflects their will to associate operational needs to academic circles.

In fact, my hypothesis, so far, is that the birth of the observatories is *indeed just one more step to reinforce the informal network born in the 70's.* The post-68 social and political context (a lot of freedom and a quite important public budget) favoured an informal association. Since the end of the 90's, because of the changes among the French research field (a lack of funding that pushes the structures to be more visible), this network has to be institutionalised in another way. This hypothesis is influenced by two concepts: the "path dependency" (P. Pierson, 2000) and the "policy window" (J. Kingdom, 1995).

The "path dependency" theory suggests that all current situations find its roots in the past. For people who defend that idea, change is deeply dependant on history. New situations do not come from nowhere, changes are never radical. Here, the observatories exist *because* this informal network has been living for a long time before. It is not an ad hoc creation.

Collaborations between researchers and local authorities are linked to institutions and political will, but most of all it seems to rely on the "profile" of people

In fact, one element helped a lot to set up collaborations: the "professional bridges" between academic circles and management services. In fact, it is striking to see the number of people who had worked in both fields: starting as a researcher to become then a technician or a manager in public services, or the contrary. It is not rare to meet someone who was first a PHD's student in Lyon, went then to make some researches in Paris, to end up being in charge of the Water Parisian Department for local authorities, for example. This kind of career helps local public services and Scientifics to develop tights links. In fact, people who know *culture, concerns and expectations of the two institutions* can increase awareness about the advantages of collaborations for both parts. In fact, main difficulty in collaborations is that people don't share the same interests neither than the same "language" to express their projects. That's why "multi-positioned" people are so helpful. They can "traduce", "decode" (Faure, 2006) the concerns of both side, and develop a "common ground".

The importance of "political appropriation"

Political support appears to be essential to understand the success (or the difficulties) of collaborations in different territories. Lyon, where is born OTHU, is a good example. Indeed, the city is really implicated in funding researches since the beginning of the scientific community in the seventies. Both researchers and public engineers have developed a trustful partnership, based on many successes, partly economical ones. The modelling developed by scientists enabled, at a very low price, engineers of the "Grand Lyon" to optimise their technical choices while urbanising new areas. Indeed, they realise quickly that associating researchers in the making-decision process – research units was somehow perceived as more efficient and "insightful" than consulting firms – made them saving money. That's how they continue to work with to the local scientific community of urban hydrology.

But another element was really helpful: local government used these successful collaborations as a way to promote the city. Civil servants were actually very proud of their innovation ability, at least partly due to the researchers' expertise. So mayors in Lyon, since the seventies, whatever their political belonging, have developed a very praising speech presenting Lyon (and its surrounding areas) as "a very advanced city". This was part of their "urban governance style" (Faure, 2007). Politicians being so involved favour a long term partnership.

CONCLUSIONS

First results enabled me to precise the core problem of my research, and the factors I had to deeply analyse. At the very beginning of my study, I was able to draw a quite easy schema (presented in the first part) to define what was at stake. But these great categories were mostly "black boxes", what was inside remained undefined. I can now precise some elements, even if these definitions are likely to change in the following months.

In addition, first results helped me reformulating what can be "innovation in storm water policies", leading to some core question to test during the coming campaign of interviews among public services (once I'm done with researchers interview): *May innovation in storm water management be characterised by an evolution to a more integrated vision of water, water being not anymore managed apart, but taking into account in the city planning?*

The scheme below represents the new formulation of the research:

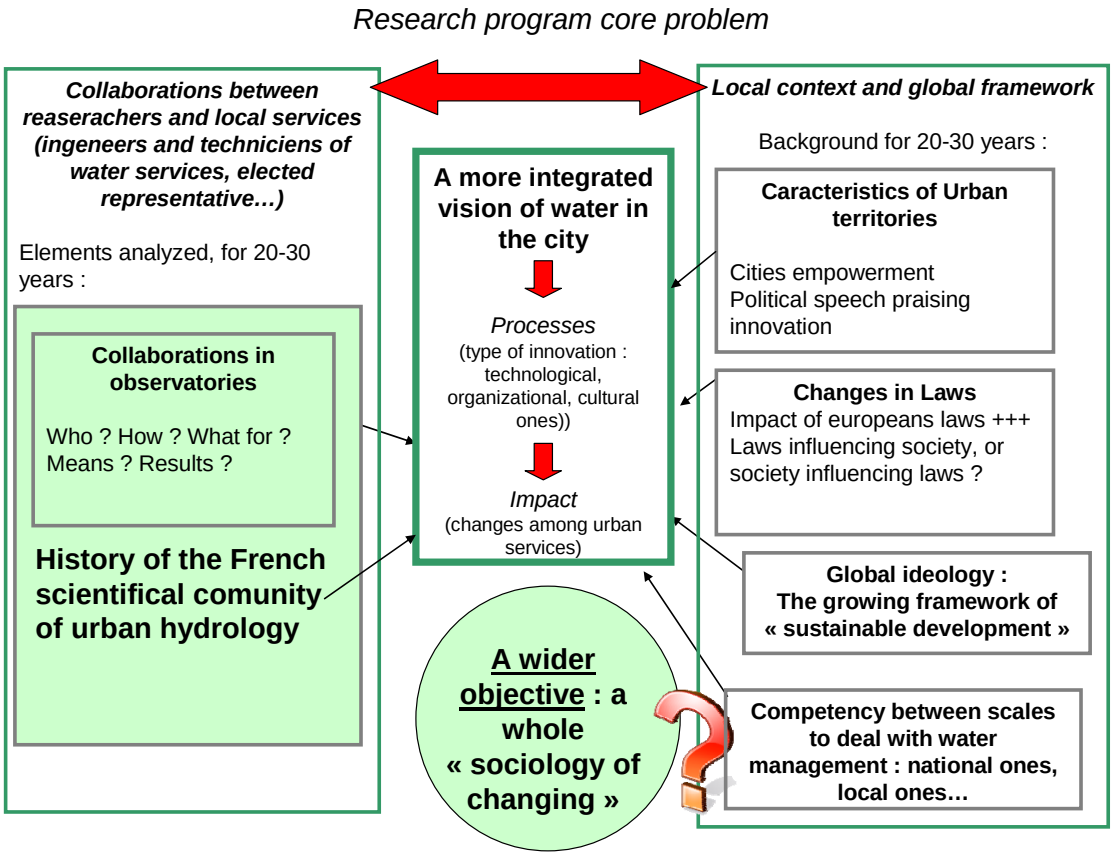

Fig. 2: New formulation of the research

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